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Office of Energy Policy and New Uses**

**RENEWABLE ENERGY:
USDA'S STRATEGY AND FUNDING,
AND OPPORTUNITIES FOR RURAL AMERICA**

APCA (Chambers of Agriculture)

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75008 Paris

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USDA



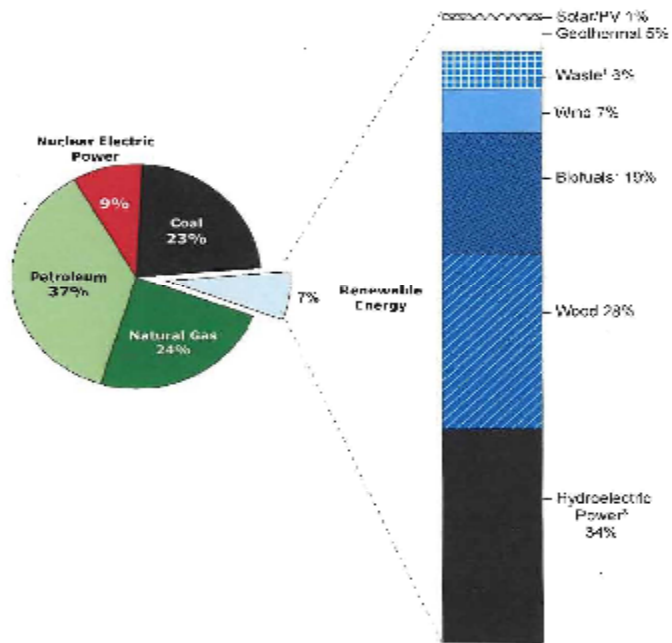
- Renewable energy opens new rural development opportunities
 - Biofuels production
 - Bioproducts
 - Wind, solar, anaerobic digestion based power
 - Geothermal power
 - Small scale hydropower
 - Product development/manufacturing/finance/maintenance/ allied products industries



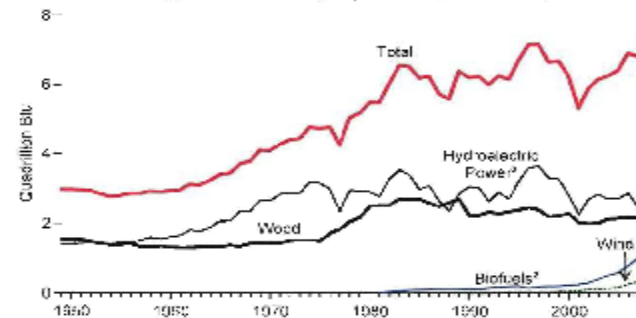
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Figure 10.1 Renewable Energy Consumption by Major Sources

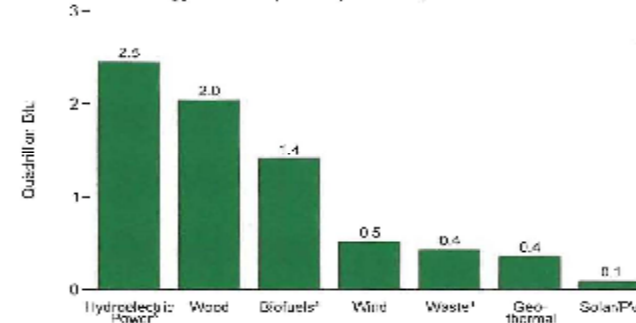
Renewable Energy as Share of Total Primary Energy Consumption, 2008



Renewable Energy Total Consumption and Major Sources, 1949-2008



Renewable Energy Consumption by Source, 2008



¹ Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

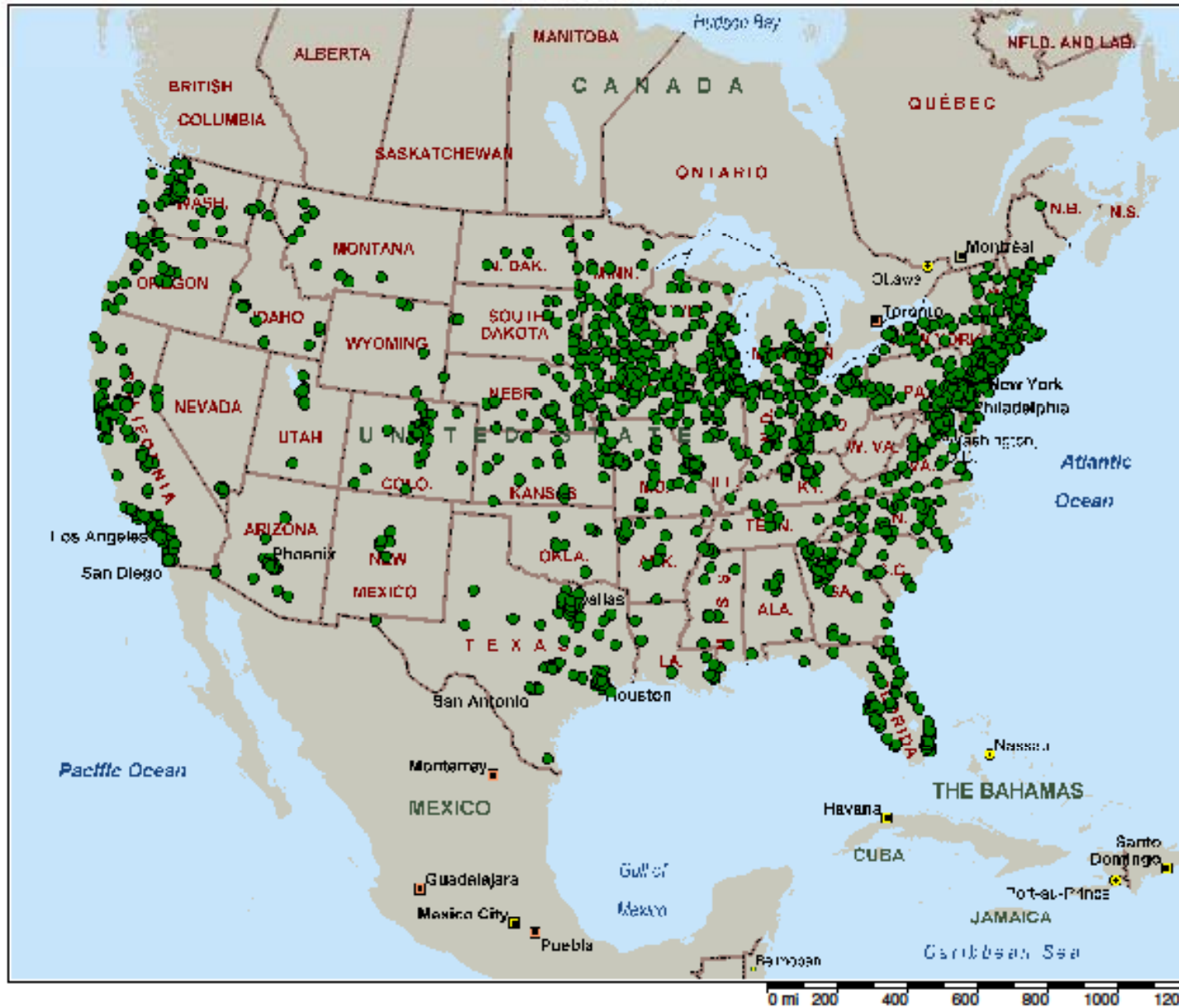
² Fuel ethanol and biodiesel consumption, plus losses and co-products from the production of fuel ethanol and biodiesel.

³ Conventional hydroelectric power.

Sources: Tables 1.3 and 10.1.

Biobased Manufacturing Firms

North America





Biobased Products

Market Potential and Projections Through 2025
Projected Global Markets of Chemical Sectors
(Billion U.S. \$)

Chemical Sector	Total 2005	Biobased 2005	Total 2010	Biobased 2010	Total 2025	Biobased 2025
Commodity	475	0.9	550	5-11	857	50-86
Specialty	375	5	435	87-110	679	300-340
Fine	100	15	125	25-32	195	88-98
Polymer	250	0.3	290	15-30	452	45-90
Total	1,200	21.2	1,400	132-183	2,183	483-614

The value of pharmaceuticals is excluded in this table

Sources: Bachmann, 2005; Cygnus Business Consulting and Research; Informa Economics, et.al.



- World-wide transition to bioeconomy is under way
 - Fossil fuels are becoming more costly and have adverse climate change effects
 - Science and technology support the transition
 - Public policy helps drive the transition
 - Climate change accords can speed transition
 - Regional resource base shapes transition
 - Time frame for transition will be measured in decades



- Environmental attributes drive transition
 - Environmental costs of fossil fuels are slowly being incorporated in resource use decisions
 - Current focus is on carbon emissions, which is only one measure of sustainability
 - Broader environmental indicators must be evaluated for policy to become sustainable
 - For example, 12 environmental and health indicators are measured in U.S./NIST's BEES LCA analysis (acidification, criteria air pollutants, ecological toxicity, eutrophication, fossil fuel depletion, global warming, habitat alteration, human health, indoor air, ozone depletion, smog, water intake)



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- Supportive public policy is an important driver in the transition to a bioeconomy
 - Basic science research
 - Loans, loan guarantees, grants
 - Product development and commercialization
 - Public/private partnerships to drive innovation
 - Regulatory requirements for renewable fuel and power use
 - Required reductions in environmental footprint
 - Procurement preference/labeling programs



- What makes renewable energy so attractive to rural areas?
 - Production facilities can be dispersed
 - Located close to feedstocks/other resources
 - Biomass, wind, sunlight, water, geothermal
 - Environmental issues may be more easily managed in rural settings
 - Adds diversity to rural economic base
 - New business investment and green job creation

Economic impacts to the Western U.S.

from CDEAC Scenario Three: 54.7 GW of new wind development by 2015
(Assuming most manufacturing happens outside the Western region.)

Wind energy's economic "ripple effect"

Direct Impacts from 54.7 GW

Landowner Revenue:

- Over \$150 million/year

Local Property Taxes:

- \$389,300,000/year

Construction Phase:

- 127,000 new jobs
- \$23.5 billion to local economies

Operational Phase (20 yrs):

- 13,400 new long-term jobs
- \$1.2 billion/year to local economies

Indirect Impacts

Construction Phase:

- 66,000 new jobs
- \$7.5B to local economies

Operational Phase:

- 3500 new long-term jobs
- \$360M/year to local economies

Induced Impacts

Construction Phase:

- 79,000 new jobs
- \$8.3B to local economies

Operational Phase:

- 7300 new long-term jobs
- \$721M/year to local economies



Source: NREL/CP-500-41808

› discount or inflation rate used. No depreciation schedule used.

Construction Phase = 1- 2 years
Operational Phase = 20+ years



- Successful development also relies upon:
 - Regional planning and partnering
 - Strategies to develop critical mass, such as cluster development
 - A systems approach, in which each step in the process is consistent with the previous one – and supportive of the next step
 - Increased use of waste streams from other activities, such as municipal solid waste
 - Sustainable development, that builds on area resource base and environmental attributes



- Hurdles to development must be cleared
 - Biofuels
 - Site selection, permits, and environmental issues
 - Scale of project to be developed
 - Ownership structure/financing
 - Access to reliable feedstock supply
 - Choice of a competitive technology
 - Starch based, cellulosic, bioliquids, algae
 - Infrastructure requirements
 - Requirements for public sector support
 - Access to drivers of demand



- Hurdles to Development must be cleared
 - Wind, solar, and anaerobic digestion systems
 - Site selection, permits, and environmental issues
 - Choice of competitive technology
 - Ownership structure/financing
 - *** Pricing of power sent to the grid
 - *** Integration of intermittent power source into grid
 - *** Develop systems to assure grid stability
 - *** Development of smart grid and high voltage transmission systems to move power to demand
 - *** Size and duration of public sector support



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- Hurdles to development must be cleared
 - Geothermal and small scale hydropower
 - ***Site selection, permits, and environmental issues
 - ***Appropriate scale of project
 - Ownership structure/financing
 - Pricing of power to consumer
 - Integration of power into grid
 - Development of smart grid and high voltage transmission systems to move power to demand



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- The U.S. is developing public sector partnering to support renewable energy
 - Federal government, such as
 - U.S. Department of Energy
 - U.S. Dept. of Agriculture
 - U.S. Department of Transportation
 - U.S. Department of Defense
 - Most states have some support programs
 - Various cities also have support programs
 - NGO support and promotion groups
 - Some international partnering



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- 2002 Farm Bill with first ever energy title
 - Created new grant and loan programs to support renewable and biomass energy research, development, and demonstration
 - Biobased products preferred procurement initiative
 - Biodiesel education program

 - 2008 Farm Bill with expanded energy title
 - Extended and substantially expanded grant and loan programs of the 2002 Farm Bill and added new programs
 - Lowered ethanol tax credit to 45 cents per gallon and created \$1.01 tax credit for cellulosic ethanol
 - U.S. Forest Service authorized to undertake research and development of biomass resources

 - 2008 Financial Assistance Package
 - All biodiesel feedstocks qualify for \$1.00 per gallon tax credit through 2010



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- Energy Policy Act of 2005
 - Provides support to develop cellulosic biorefinery demonstration projects, six projects were funded to explore different technologies
 - Provided for a 7.5 billion gallon renewable fuels standard by 2012 with 250 million gallons to be derived from cellulosic biomass
 - Provided a variety of incentive programs for biofuels including extension of the ethanol tax credit of \$0.51 per gallon of ethanol, \$1.00 per gallon of agri-biodiesel, and \$0.50 per gallon of waste grease biodiesel
 - Tax credit of \$0.10 per gallon to small agri-biodiesel and ethanol producers

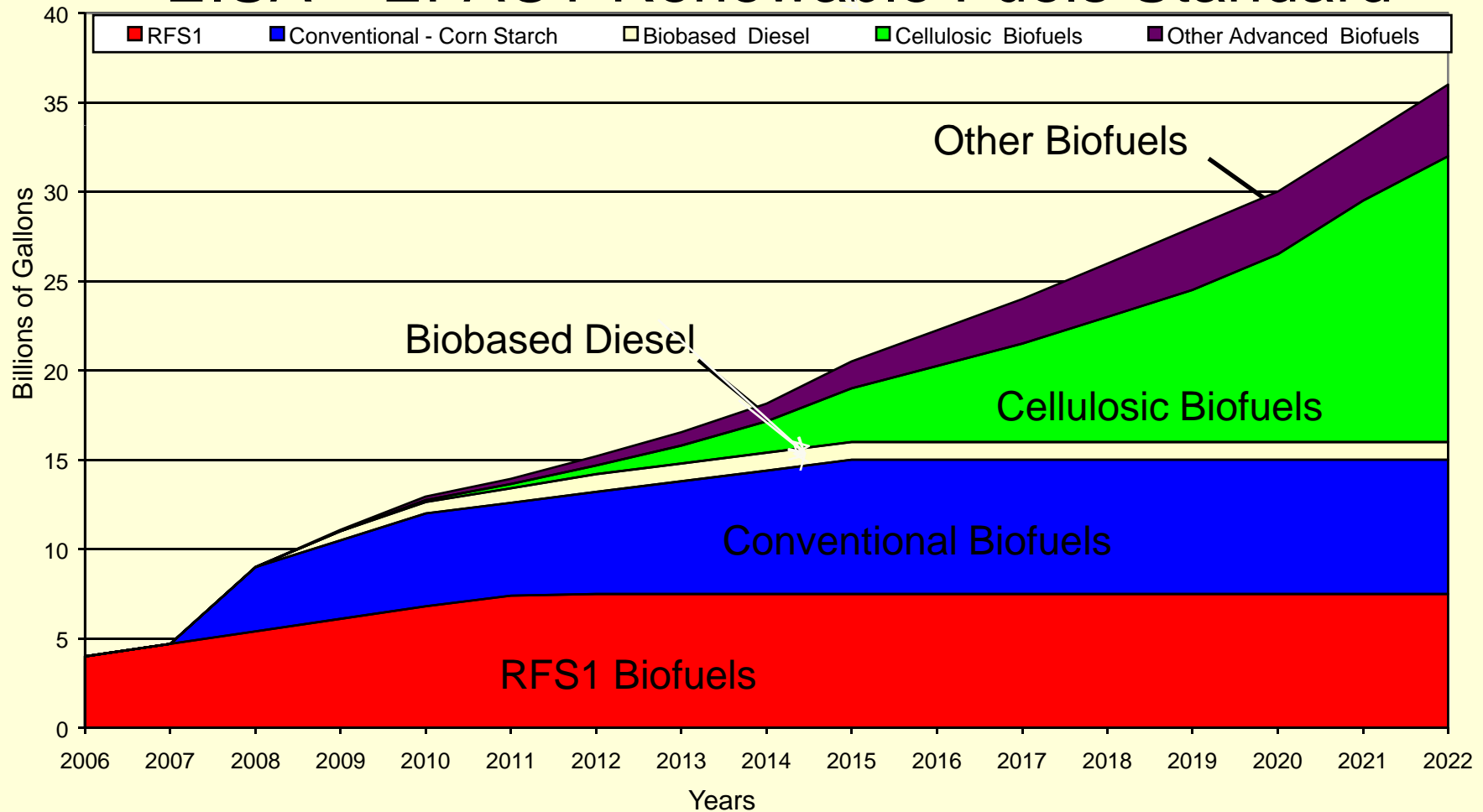


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- Energy Independence and Security Act of 2007
 - Expansion of Renewable fuel standard to 36 billion gallons
 - Lifecycle greenhouse gas emission reductions from 2005 baseline transportation fuel emissions
 - Current ethanol plants grandfathered in
 - Advanced biofuels must meet 50% reduction
 - Biomass based diesel must meet 50% reduction
 - Cellulosic biofuels from biomass must meet 60% reduction
 - Reductions include direct and indirect green house gas emissions

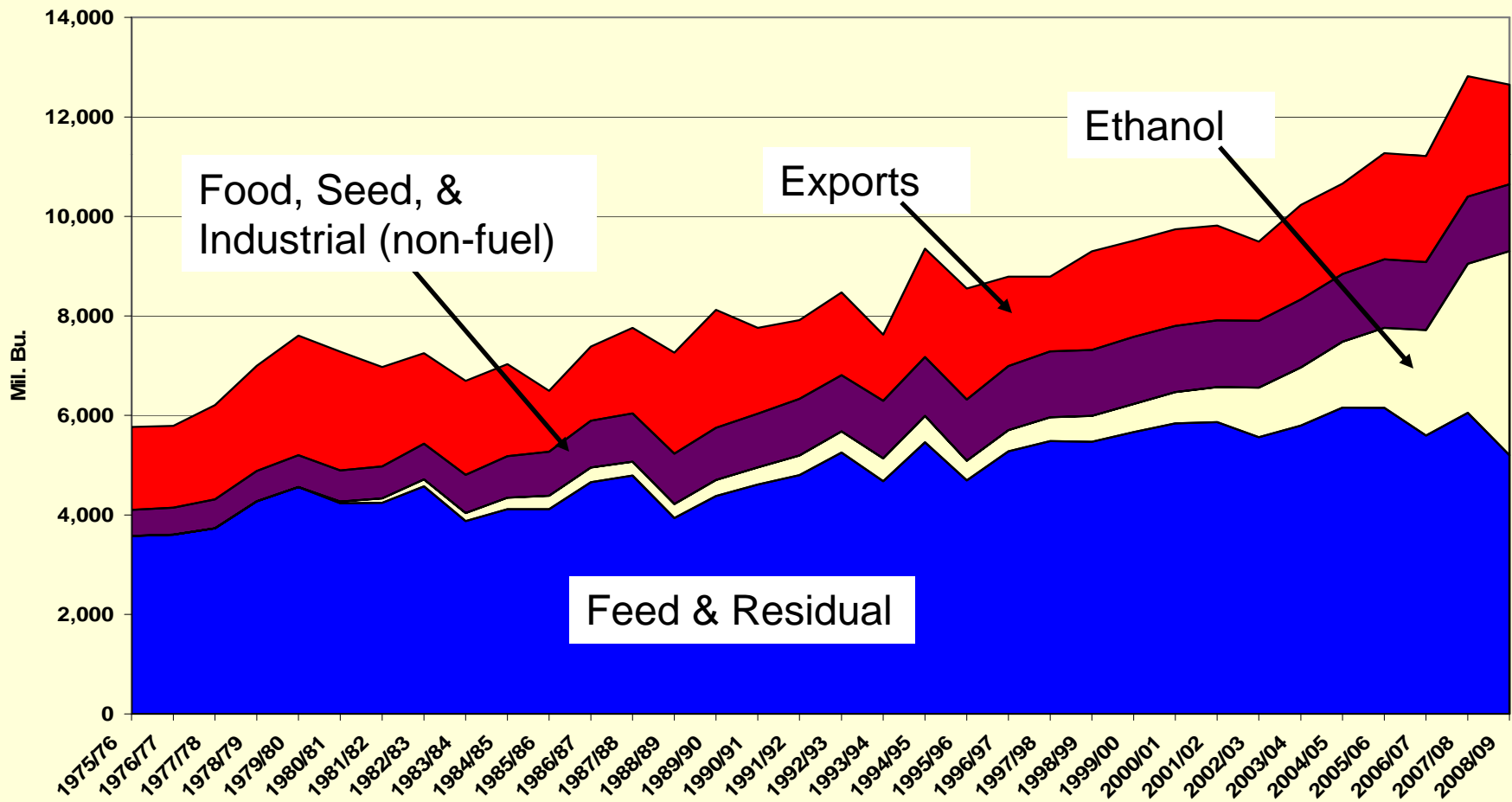


EISA – EPACT Renewable Fuels Standard



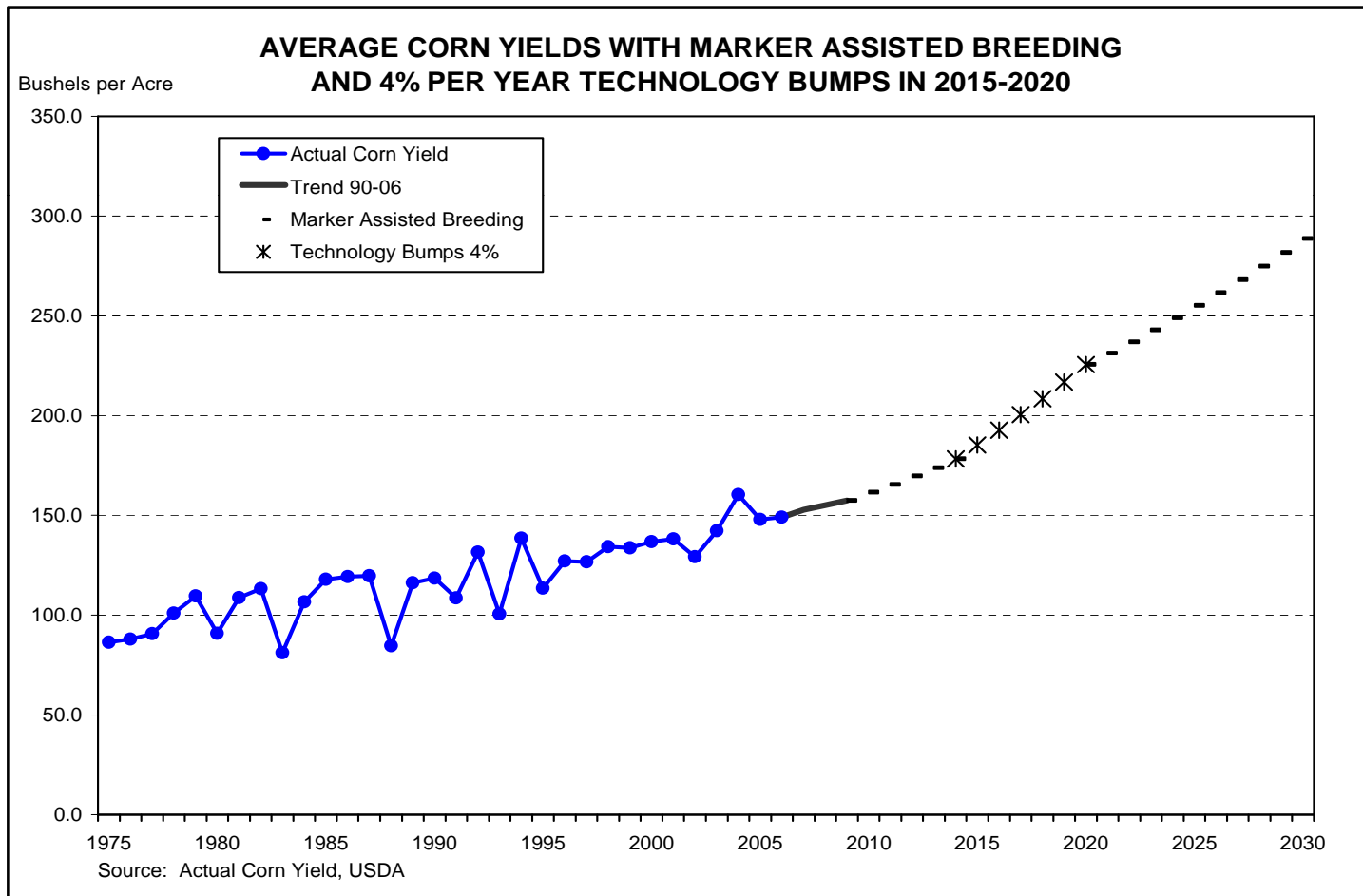


U. S. Corn Use





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- Current biofuels production
 - Ethanol production capacity
 - Total annual plant capacity of 14.535 billion gal.
 - 216 plants, including those under construction
 - Biodiesel production capacity
 - 202 plants, including those under construction
 - Total annual plant capacity of 3.118 billion gallons



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- U.S. Government assistance provided:
 - Research and development support
 - Product development and commercialization
 - Support on first-of-a-kind production facilities
 - Grants for business planning
 - Loans and loan guarantees
 - Regulatory support initiatives
 - Production tax credits
 - More useful if credits can be traded among firms
 - Market access programs



- USDA (2009-12) renewable energy/products
 - Marketing and labeling \$17 million
 - Biorefinery assistance/repowering \$1.015 billion
 - Advanced biofuels refinery support \$400 million
 - Biodiesel education program \$5 million
 - Rural energy for America program \$355 million
 - Biomass R and D program \$258 million
 - Rural energy self-sufficiency initiative \$20 million
 - Feedstock flexibility for bioenergy producers
 - Biomass crop assistance program \$25 million
 - Forest biomass for energy \$60 million
 - Community wood energy program



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- **USDA, renewable energy/products**
 - **Rural Utility Service**
 - Loan guarantees totaling \$197,718,000 on 5 renewable power loans in 2009

 - **CSREES**
 - \$20+ million in 2010

 - **Agricultural Research Service**
 - Biobased products
\$46 million in 2010
 - Bioenergy/renewable energy programs
\$42 million In 2010

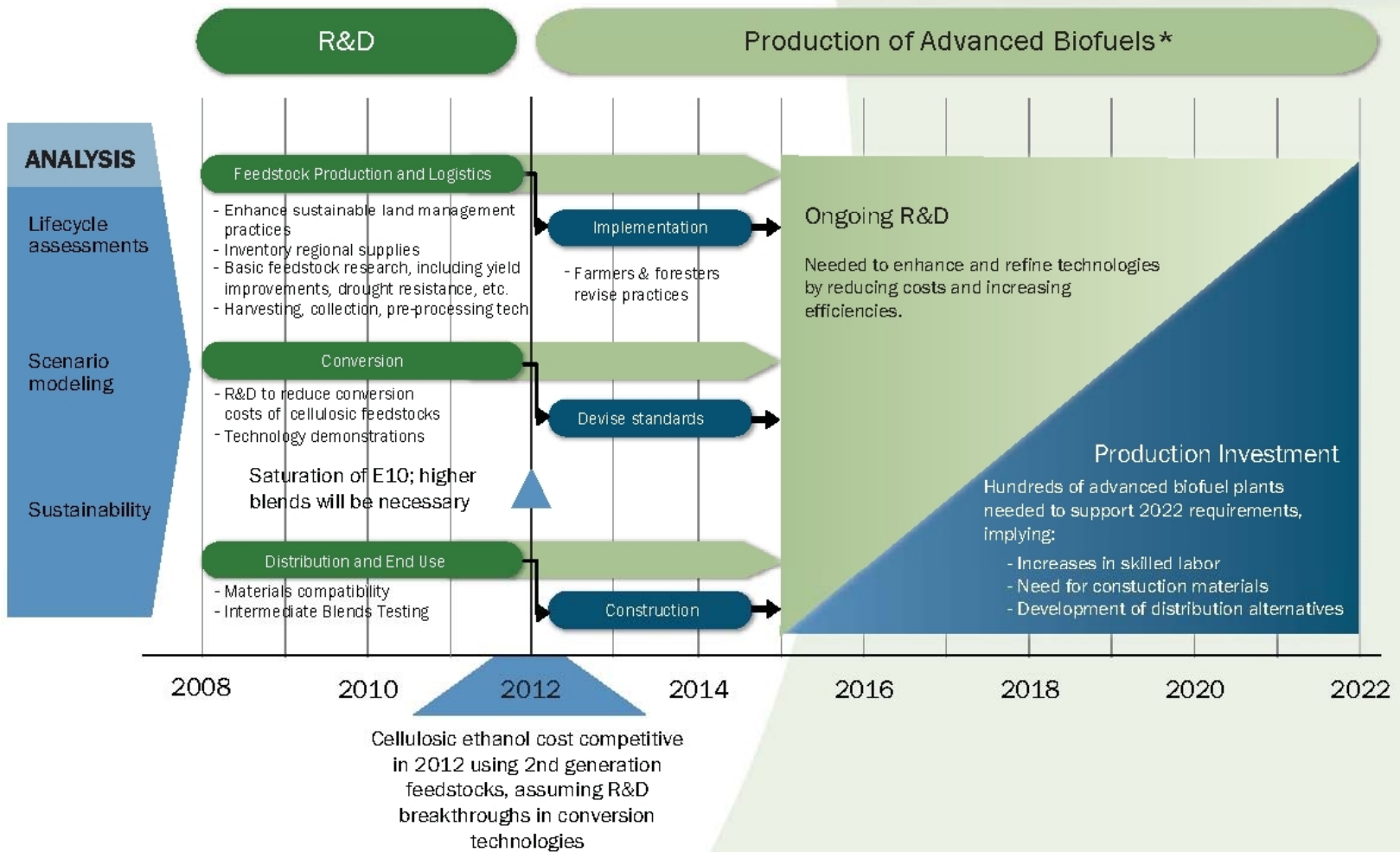


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- Biomass Research and Development Board's 2008 National Biofuels Action Plan
 - Maximize sustainability
 - Increase feedstock production
 - Improve feedstock logistics
 - Work to advance conversion science and technology
 - Improve distribution infrastructure
 - Improve biofuels blending capability
 - Assure environmental and health safety
 - The Board's time line for the action plan



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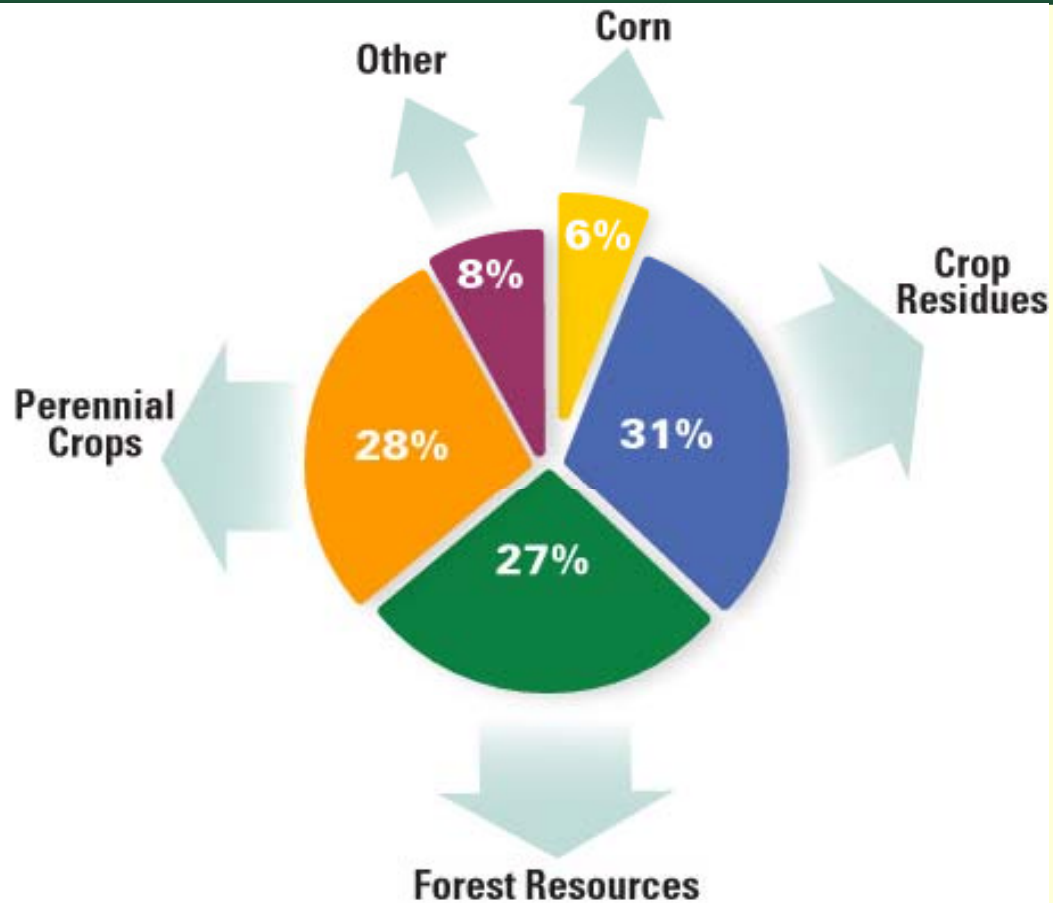


* Advanced biofuels can include 2nd generation cellulosic ethanol, biobutanol, biodiesel, etc.

Source: Biomass Research and Development Board



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Projected U.S. Biofuel Sources

Source: Biomass as Feedstock for a Bioenergy and Bioproducts Industry: Technical Feasibility of a Billion Ton Annual Supply, 2005. DOE and USDA.



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- Operational challenges yet to be solved
 - Limitations on necessary water resources for feed stock production and processing
 - Logistics issues in collecting and transporting biomass to processing plant and moving products to customers
 - Appropriate plant scale where radius from which biomass feedstock can be collected is quite small
 - Development and marketing of co-products to enhance economic feasibility – the biorefinery model
 - Developing efficient product distribution
 - Creating conversion efficiency needed to be profitable
 - Identifying feedstock profitability required to bid land resources from other crops



- Conclusion
 - The transition to a biobased economy is underway and will not be reversed
 - The nature of renewable energy supports development in rural areas
 - Sustained public sector support is essential
 - Public/private partnering is integral to development
 - Type and scale of development is matched to area's resource endowment and location
 - Exciting new rural business opportunities